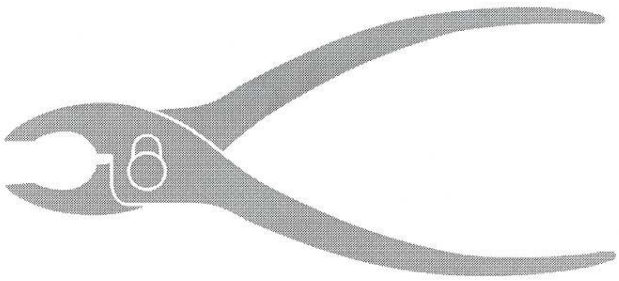
FISCHER Model MD-1a
Galvanic Unit



Technical Reference Manual
and
Periodic Inspection Procedure

FISCHER

MODEL MD-1a Galvanic Unit
Technical Reference Manual

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FOR PROFESSIONAL USE ONLY

Rev. 7/96
Rev. 12/04

MD-1a Galvanic Unit

The Model MD-1a Galvanic Unit offers a versatile approach to the use of Galvanic (DC) current in certain medical applications employing anaphoresis, cataphoresis, or iontophoresis. It is designed for use by physicians in a clinic setting, and generates an adjustable, filtered DC current from normal AC line voltage. Standard accesssories supplied with the unit include:

(1) Dual Patient Cordset (red and black cords)	p/n 15-0003
(2) 3" x 6" Wet pad electrodes	p/n 12-0019
(1) Iontophoresis Trays (OPTIONAL)	p/n 13-0020

TYPICAL INSTALLATION

Locate the Galvanic Unit near a treatment area where all controls are easily accessible. Plug the line cord into a 110-115 volt A.C. **grounded** wall receptacle (220 volt operation is available on special order only).
DO NOT USE "CHEATER" OR ADAPTER PLUGS. PROPER GROUNDING IS ESSENTIAL FOR SAFE AND PROPER OPERATION OF THIS DEVICE. The MD-1a is equipped with a “hospital grade” plug to ensure reliable grounding, although the plug will fit typical grounded receptacles. Because of its light weight and small size, the MD-1 is very portable. When relocating the unit for use, however, always be sure it is properly grounded.

Insert the dual-prong plug at one end of the patient cordset into the front panel jacks; the red jack is always positive with respect to the black (negative). The plugs at the opposite ends of each cord should be firmly plugged into the accessory electrodes to be used for treatment.

PRECAUTIONS

CAUTION: PRODUCES HIGH VOLTAGE. Always exercise care and follow safety procedures when operating or servicing this device.

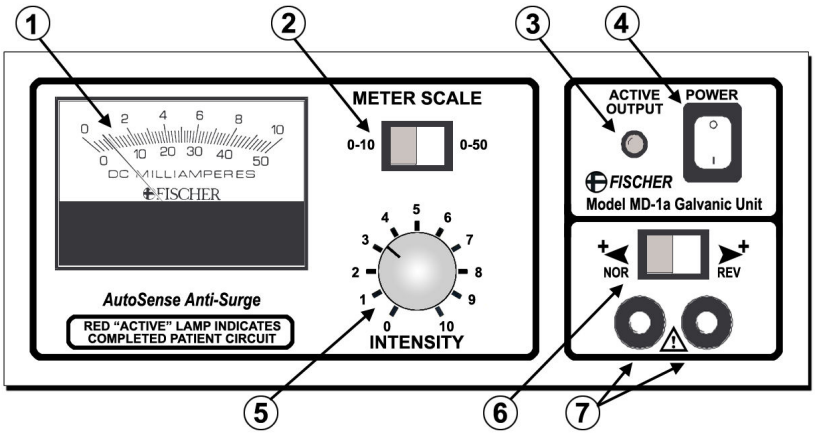
Disconnect the power cord when servicing the unit to reduce the risk of shock hazard. Avoid contact with in-circuit capacitors which may retain a high voltage charge.

Wait at least 3 minutes after disconnecting from power source to allow circuit components to fully discharge before performing any service.

Do not move or carry the unit by any attached cords.

Do not subject the machine to excessive shock or vibration; do not use or store in places where termperature is over 105 degrees, or in high humidity.

Description of Model MD-1a panel controls



1 **DC MILLIAMPERE METER**
This analog meter indicates *actual* current flow, in DC Milliamperes, through the connected patient circuit. *A reading can only be obtained when a resistive load is applied between output jacks and the INTENSITY knob is adjusted.*

2 **METER SCALE SWITCH (0-10 and 0-50)**
This switch selects the meter scale to be used for indicating current flow. Read from the TOP range (0-10) when the switch is in the "0-10" position, and from the BOTTOM range (0-50) when in the "0-50" position. This switch does not change the level of output, only the meter scale. Use the "0-10" scale for a more accurate reading when using currents less than 10 milliamperes.

3 **ACTIVE LAMP**
This red LED will glow ONLY when the Galvanic Unit detects both a completed patient circuit and active current flow. *This lamp does not indicate a power-on condition, but only current activation.*

4 **POWER SWITCH**
Press the LOWER edge (marked "1") of this rocker-type switch to turn ON the Galvanic Unit. The red colored top edge of the switch will be exposed when the power is turned ON.

5 **INTENSITY KNOB**
Adjust this knob to set the desired current level to be applied to the patient. The actual current is indicated on the "DC MILLIAMPERES" meter when the patient circuit is completed. *Since current flow is dependent upon the patient circuit resistance (which varies with electrode contact area and skin moisture), only the meter reading can provide an accurate indication of current level - the INTENSITY knob position may vary.*

6 **POLARITY REVERSAL SWITCH (Applies to units made after 1/1/2005)**
Press the left side for normal (**NOR**) polarity (red jack is positive), or the right side for reverse (**REV**) polarity (black jack is positive). Use this switch to reverse polarity instead of swapping the patient cord plugs. *Always return the INTENSITY to "0" before changing polarity.*

7 **OUTPUT JACKS**
Two "banana" jacks allow connection of patient cords to the machine. The RED jack (marked "+") is always positive with respect to the BLACK (negative) jack. The supplied Dual Patient Cordset uses a single, dual-prong plug at one end to allow quick connection or reversal of electrode polarity as needed. Always insure that the plug is securely attached to the output jacks during treatment.

DEVICE SPECIFICATIONS

Device Name:	MD-1a
Manufacturer:	R.A. Fischer Co., Inc.
Power Source:	AC line 110-115 VAC 60 Hz
Fuse Rating:	3/8 Amp, Type 3AG
Number of Output Modes:	1
Mode Type:	Direct Current (DC)
Constant Current:	No
Constant Voltage:	No
Minimum Output Voltage:	0.0 VDC
Maximum Output Voltage:	150 VDC (no load)
Minimum Output Current:	0.0 DCma
Minimum “Active” Current:	1.0 DCma (load dependent)
Maximum Output Current:	Load dependent: 50 DCma (meter FS) w/nominal 1K load 78 DCma direct short
Output Short Circuit Duration:	1 minute
Line Current Isolation:	Split bobbin transformer (UL #E63829)
Automatic Trip overload:	N/A
Patient Override Control:	N/A
Indicator Display:	Unit Functioning (Active lamp) Current Level (analog DC milliameter)
Meter ranges:	0-10 DCma w/0.2ma resolution 0-50 DCma w/1.0ma resolution
Meter Accuracy	-20% to +20% FS
Timer/Auto shutoff:	N/A
Typical Leakage current:	Chassis: 10 uA Electrodes: 5 uA
Maximum Leakage current:	Chassis: 50 uA Electrodes: 50 uA
Standards:	UL-544 Patient Connected or equivalent
Electrical Safety Certification:	Los Angeles Electrical Testing Laboratory Application #249247

Note: Output specifications measured at 115VAC line voltage

DEVICE MAINTENANCE

The Model MD-1a does not require specific periodic maintenance beyond regular inspection of the device and accessory cords. Refer to the following page for recommended inspection procedures.

DEVICE INSPECTION

The factory recommends inspecting this device according to the following schedule. Inspections may be performed at other intervals as required by maintenance personnel at the installation site, but in no event should the interval between inspections exceed 24 months.

Visual Device Inspection
Period: Annually (12 months)

Line Cord and plug:
- ◊ Inspect for insulation wear, broken wires, exposed wires, loose Heyco grip
- ◊ Inspect for bent or broken plug spades, bent or broken ground connection
- ◊ Replace line cord upon evidence of wear or breakage

Panel Controls:
- ◊ Inspect for damaged or worn panel controls.
- ◊ Rotate Intensity control knob to check for positive stops at Minimum and Maximum.
- ◊ Tighten Intensity control knob if knob is loose.
- ◊ Check integrity of Output Jacks and replace if corrosion or cracks are evident.
- ◊ Verify operation of "Active" LED by applying a 1K to 10K ohm load across Output Jacks and rotating Intensity knob. LED should be off at Minimum intensity setting and turn on at a setting of 1-2 on the knob.
- ◊ Verify operation of Polarity Reversal switch (applies to units made after 1/1/2005). Switch in "REV" position will reverse polarity at red & black panel jacks..
- ◊ Verify operation of Meter by applying a 1K to 10K ohm load across Output Jacks and rotating Intensity knob. Confirm at both meter scales (0-10 and 0-50) with a nominal output setting of 10 DCma as indicated on the meter.

Cabinet:
- ◊ Inspect case for evidence of cracks or breakage.
- ◊ Ensure that bottom panel screws (4) are tight and front and panels are properly seated in the housing (only necessary if unit has been opened for access to circuitry).

Visual Electrode Inspection
Period: 6 months

Electrodes and Cords:
- ◊ Inspect patient cords (red and black) for evidence of wear, broken wires, exposed wires or corroded banana jacks
- ◊ Replace patient cords regularly (12-24 months) or if wear is evident.
- ◊ Inspect dual plug at one end of cords; tighten allen screw if necessary to clamp internal wire.
- ◊ Inspect electrodes (wet pads or Iontophoresis trays) for evidence of breakage or corrosion. Replace if necessary.

Electrical Device Inspection
Period: Annually (12 months)

Line Voltage, Ground Integrity:

- ◊ Measure line voltage supplied to the device . **Accept: 105-120 VAC**
- ◊ Confirm reliable ground connection by ensuring line receptacle is 3-prong grounded type and ground integrity is intact. **Accept: Ground OK**
- ◊ Measure device ground wire resistance between line plug ground contact and the screw near the Heyco cord grip on the rear panel. **Accept: 0 to 1.0 ohm** Nominal reading is .1-.2 ohms. *IMPORTANT: Do not make this measurement between line plug ground contact and front or rear panel surfaces; these panels are anodized and will not conduct.*

Chassis and Patient Leakage:

- ◊ Measure ground leakage between line and chassis using an approved Electrical Safety Analyser. Use screw head near the Heyco cord grip on the rear panel for chassis connection. **Accept: Less than 50uA**
  IMPORTANT: Do not make this measurement between line and front or rear panel surfaces; these panels are anodized and will not conduct.
  Nominal readings appear below for reference.
  Normal Polarity-Normal Ground: 5 uA
  Reverse Polarity-Normal Ground: 5 uA
  Normal Polarity-Open Ground: 10 uA
  Reverse Polarity-Open Ground: 10 uA
- ◊ Measure patient lead leakage between line and red and black Output Jacks using an approved Electrical Safety Analyser. **Accept: Less than 50uA**
  Nominal readings appear below for reference.
  Normal Polarity-Normal Ground: 5 uA
  Reverse Polarity-Normal Ground: 5 uA
  Normal Polarity-Open Ground: 5 uA
  Reverse Polarity-Open Ground: 5 uA

Dielectric Strength Test (OPTIONAL):

- ◊ Apply 1250 VAC, 60 Hz between line and chassis ground for 60 seconds using an approved Dielectric Withstand Tester, with Cutoff current set to 1.0-2.0 ma.
- ◊ Apply 1250 VAC, 60 Hz between line and patient leads (red and black jacks) for 60 seconds using an approved Dielectric Withstand Tester with Cutoff current set to 1.0-2.0 ma. **Accept: No Breakdown**

IMPORTANT: Observe safety precautions when conducting dielectric strength test. Do not return to service any device which has failed the withstand test as it may have become internally damaged. This test is optional and does not need to be conducted annually.

Electrical Device Inspection *(Continued)*
Period: Annually (12 months)

Device Output:

PRELIMINARY SETUP:

- Plug line cord into a grounded receptacle and press the bottom edge of the POWER switch to turn on the MD-1a (red portion of power switch will be visible). Note that the red "ACTIVE" LED will NOT be lit unless a patient circuit is completed between the Output Jacks and current is flowing.
- Attach the dual patient cordset to the Output Jacks and make all measurements between the red and black banana plugs at the end of the cordset using a series load resistance of 1K ohm rated at 3 watts or more. (A 2 watt resistor may be used for short duration measurements).

OUTPUT MEASUREMENTS:

◊ Measure Minimum output using a DC milliameter in series with a 1K load resistance and Intensity control knob set to its minimum position. This measurement simply confirms that there is no unintended output current with the Intensity knob at its minimum (zero) position. **Accept: 0 DCma**

◊ Measure Maximum output using a DC milliameter in series with a 1K load resistance and Intensity control knob set to its maximum position. Note that the MD-1a can produce approximately 50 DCma at this this setting, which will require a resistor rated at 2.5 Watts or higher. **Accept: 40-58 DCma**

◊ Verify meter reading on 0-10 scale. With a 1K load resistance, set the METER SCALE switch to the 0-10 position and adjust Intensity until the the meter settles on a reading of 10ma (full scale). Measure the actual current using a DC milliameter in series with the load resistance. **Accept: 8.0-12 DCma**

◊ Verify meter reading on 0-50 scale. With a 1K load resistance, set the METER SCALE switch to the 0-50 position and adjust Intensity until the the meter settles on a reading of 20ma. Measure the actual current using a DC milliameter in series with the load resistance. **Accept: 16-24 DCma**

NOTE: The MD-1a incorporates circuitry to slowly ramp the output current to its set value when a load resistance is detected. Therefore, you must allow several seconds for the output current to stabilize before making these measurements.

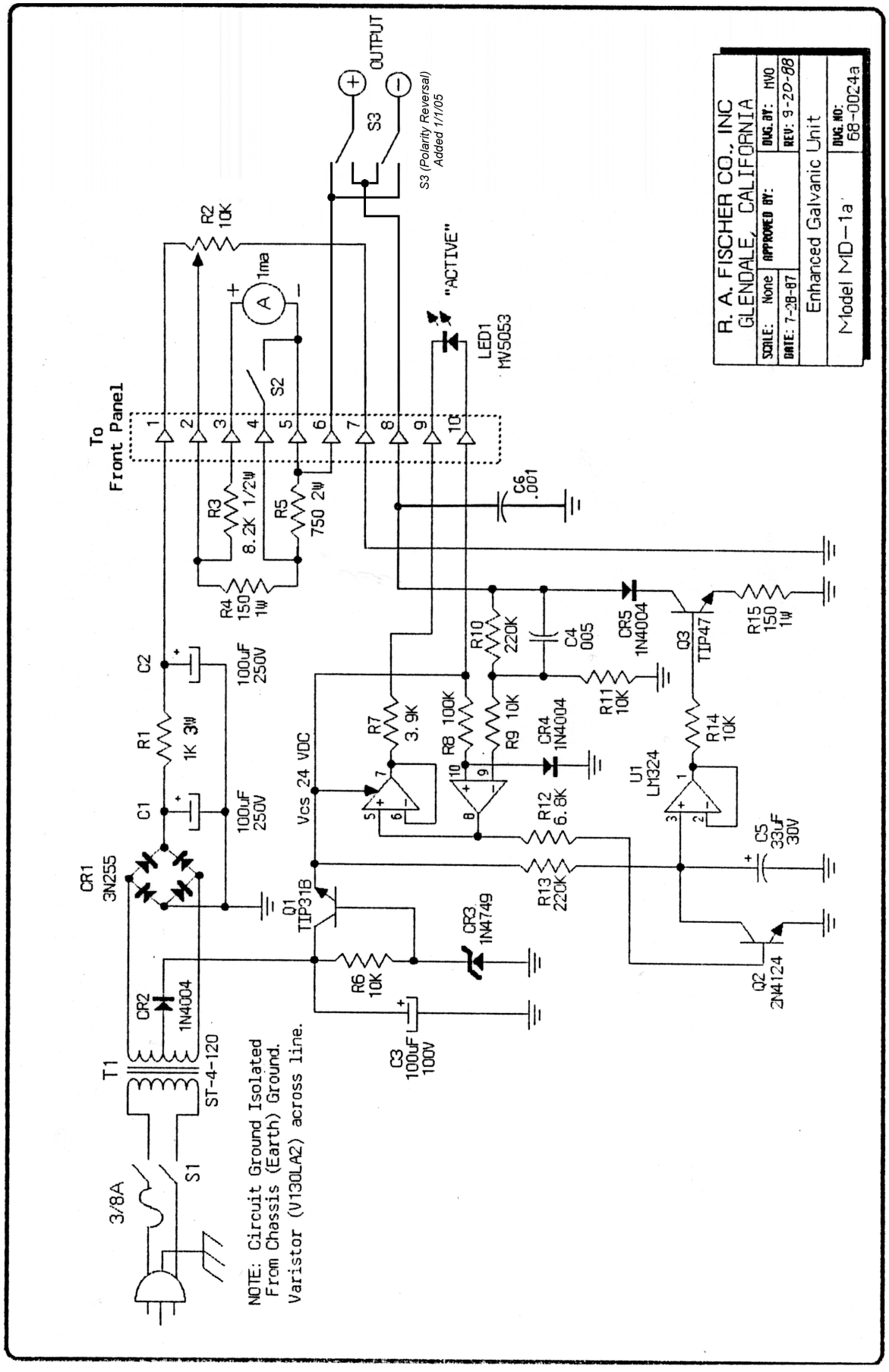
AC RIPPLE (OPTIONAL):

◊ Measure the AC ripple present in the output current by connecting an *isolated ground* oscilloscope in parallel with the 1K load resistance. Adjust Intensity for a metered output of 20 DCma (using 0-50 scale) and observe the AC component (ripple) superimposed on the DC waveform. **Accept: 0-.5 Vpp (2.5%)**

Note: Output specifications measured at 115VAC line voltage

PARTS LIST

Part No.	*Item Description*	*Quantity*
12-0019	*3 x 6 Wet Pad*	*2.00*
15-0003	*Dual Patient Cordset*	*1.00*
21-0019	*TIP31B Transistor*	*1.00*
21-0023	*2N4124 Transistor*	*1.00*
21-0028	*1N4004 Diode*	*3.00*
21-0033	*V130LA2 Varistor*	*1.00*
21-0038B	*3N255 Diode Network*	*1.00*
21-0044	*TIP47 Transistor*	*1.00*
21-0045	*1N4749 Zener Diode*	*1.00*
23-0015	*MV5053 Red LED*	*1.00*
23-0029	*Modutec T1S 1ma Meter*	*1.00*
27-0012	*LM324 Quad OP-Amp IC*	*1.00*
31-0028	*6.8K ohm 1/4W Resistor*	*1.00*
31-0030	*10K ohm 1/4W Resistor*	*4.00*
31-0037	*3.9K ohm 1/4W Resistor*	*1.00*
31-0044	*150 ohm 1W Resistor*	*2.00*
31-0045	*220K ohm 1/4W Resistor*	*1.00*
31-0046	*8.2K ohm 1/4W Resistor*	*1.00*
31-0050	*750 ohm 2W Resistor*	*1.00*
31-0062	*100K ohm 1/4W Resistor*	*1.00*
31-0075	*330K ohm 1/4W Resistor*	*1.00*
32-0004	*1K 3 1/4W Ceramic Resistor*	*1.00*
38-0004	*10K 2W 53C3 Pot.*	*1.00*
41-0013	*100uf 100V Electrolytic*	*1.00*
41-0015	*100uf 250V Electrolytic*	*2.00*
41-0033	*33uf 25V Tantalum*	*1.00*
45-0015	*.005uf 50V Ceramic Disc*	*1.00*
45-0006	*.001uf AC By-pass*	*1.00*
45-0006A	*.001uf AC By-pass CSA*	*2.00*
54-0021	*ST-4-120 Transformer*	*1.00*
61-0015	*62021221 Rocker Switch*	*1.00*
61-0015a	*62022221 DPDT Switch*	*1.00*
61-0018	*DPST Mini Curvette Switch*	*1.00*
65-0001	*Black Banana Jack*	*1.00*
65-0031	*3AG Fuse Holder*	*1.00*
65-0039	*Red Banana Jack*	*1.00*
65-0056	*47745 Crimp Socket*	*10.00*
65-0076	*36 Pin "BergStik"*	*0.30*
65-0082	*10 Pin Contact Housing*	*1.00*
66-0014	*#10 Red Crimp Lug*	*3.00*
67-0020	*Hospital Grade Line Cord*	*1.00*
68-0024B	*MD-1a PCB Rev B*	*1.00*
69-0004	*3/8 Amp Slo-Blow Fuse*	*1.00*
77-0004	*Varflex #6 HO tubing*	*1.50*
81-0048	*TS-1/MD-1 Cabinet*	*1.00*
83-0022B	*MD-1A Front Panel*	*1.00*
83-0059	*MD-1A Rear Panel*	*1.00*
88-0046	*Universal Knob*	*1.00*
91-0026	*Fuse Repl. Label*	*1.00*
91-0003	*Serial Number Plate*	*1.00*


R. A. FISCHER CO., INC
GLENDALE, CALIFORNIA
SCALE: None
APPROVED BY:
DWG. BY: MVO
DATE: 7-28-87
REV: 9-20-88
Enhanced Galvanic Unit
Model MD-1a
DWG. NO: 68-0024a
OUTPUT
S3 (Polarity Reversal) Added 1/1/05
"ACTIVE"
LED1 MV5053
R2 10K
1ma
S2
S3
To Front Panel
R3 8.2K 1/2W
R5 750 2W
R4 150 1W
C6 .001
R10 220K
C4 005
CR5 1N4004
Q3 TIP47
R15 150 1W
R1 1K 3W
C2 100uF 250V
C1 100uF 250V
R7 3.9K
R8 100K
R9 10K
CR4 1N4004
R11 10K
R14 10K
U1 LM324
Vcs .24 VDC
R12 6.8K
C5 33uF 30V
CR1 3N255
Q1 TIP31B
R13 220K
CR3 1N4749
R6 10K
Q2 2N4124
CR2 1N4004
T1 ST-4-120
C3 100uF 100V
3/8A
S1
NOTE: Circuit Ground Isolated From Chassis (Earth) Ground.
Varistor (V130LA2) across line.